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**DAVID W. WARE**

MANAGER, CODES & REGULATION  
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January 29, 2003

Commissioner Robert Pernel  
Commissioner Art Rosenfeld  
Energy Efficiency Committee

Bill Pennington  
Bryan Alcorn  
Bruce Wilcox, Berkeley Solar Group

California Energy Commission  
1516 Ninth Street  
Sacramento, Ca 95814-5512

RE: COMMENTS ON 2005 BUILDING ENERGY EFFICIENCY STANDARDS;  
FEBRUARY 4<sup>TH</sup> COMMITTEE WORKSHOP; *Draft 2005 Residential ACM Manual—  
RQ 2005 High Quality Insulation Installation Procedures*

Dear Commissioners and Bill Pennington:

Please accept these comments and suggestions I have regarding the proposed High Quality Insulation Installation Procedures contained in the draft 2005 Residential AC Manual. These comments relate to the specific issues being addressed by staff's site review of the inspection and measurement process and technical information provided by the Cellulose Insulation Manufacturers Association (CIMA).

It is the desire of Owens Corning and NAIMA that the proposed installation procedures be structured such that they can be relatively easily field implemented yet assure quality of the installed material. If the CEC's desire is to equate compliance credit with installation quality, then it is imperative all systems are inspected; not some protracted inspection process for select materials or installation techniques based on unfounded science.

To this end, the primary issues left unanswered from our conference calls are:

1. Should the installed density of cellulose systems be verified in the field to insure the correct overall R-value for the building?
  - a. Related question: Should the installed density of any blown or sprayed wall system be verified in the field to insure the correct overall R-value for the building.

2. Are there other extraneous features of cellulose installations that could affect the installation integrity of these systems, such as settling, moisture, etc.?

These outstanding issues focus on cellulose insulation because the current draft procedures have eliminated nearly all site verification for this product type, without any supporting backup information. I thank CIMA for providing information in the last several weeks and my comments below are from reviewing that information as it applies to the two issues noted above. I am also including comments regarding the current draft installation procedures.

### **Comments on CIMA Technical Information:**

1. Should the installed density of cellulose systems be verified in the field to insure the correct overall R-value for the building? YES

I do not believe the CIMA data supports excusing cellulose providers from measuring their installed density. The data generally shows that the curve for density vs. conductivity is relatively flat, but in truth it is a function of both moisture content and the thickness of the test specimen. Test data from the 3 ½-inch tests cannot be combined with test data at thicker levels since the R/inch is up to 9% higher at the thicker specimens. Most testing is done on dry specimens; hence it is difficult to assess the relevancy of much of the data.

The following are other observations from the reports:

- Cellulose insulation settles, possibly immediately, after installation and often at a rapid rate. (CIMA 1/27/94)
- Spray applied cellulose insulation must be left open for at least 24 hours after installation and until the moisture content is < 25 %. (ICBO ER-2833)
- Stability testing results were biased. (Vibration resistance testing - Graves).
  - All the drying was done in a horizontal orientation. The only time the specimens were vertical was a 1-hour test period. Therefore, no aging or sagging vs. time was observed.
  - Also drying to constant weight at 75F / 50% required 14 days.
  - Initial moisture content was 8-23 % vs. CIMA recommendation of 30 to 40% by weight. (CIMA #3)
- In CIMA #3 - Liquid to fiber ratio should be 30 to 40 %. Dry to < 25 %, usually 24 to 48 hours minimum. Do not use when below freezing outside unless heated structure.
- In R-value of SACI - Yarbrough - "In one case, a two month conditioning period was required "to dry the specimen for thermal testing." All SACI R/inch values were less than 3.51.
- Graves on low density k-values - Figure shows shotgun results with +/- 7.5 % k range at same density.

- New Methods - Uncertainty of cellulose measurements greater than for fiberglass.
  - NIST (NBS) recommendation - measurements in attic - thickness and density.
  - Yarbrough on R-value for AEP products - 2 x4 and with 6 measurements are indicative of thickness effect for cellulose, therefore cannot lump data sets together. ASTM C687 requires use of higher thickness. Thus R/inch values are lower by 5.2 to 8.8 %.
  - Graves - Wide range of product density and k-values due to input stock. Ranges as high as 1.67 to 2.69 pcf for a 1.5 pcf nominal product.
- Related question: Should the installed density of any blown or sprayed wall system be verified in the field to insure the correct overall R-value for the building. YES
- None of the information provided substantiates the contention that blown or sprayed wall and ceiling systems are fail-safe. The ICAA and others recommend measuring thickness and density to insure proper installation. There's no reason to exempt any kind of insulation material from this need simply because it over-burdens the proposed compliance procedure.
2. Are there other extraneous features of cellulose installations that could affect the installation integrity of these systems, such as settling, moisture, etc.? YES
- See points above.
  - Canada Mortgage and Housing Corporation (CMHC)—Technical Series 90-240.
    - Results showed after spraying walls with cellulose insulation: wood sheathing moisture 26% after 30 days; traces of fungi observed in wall; cellulose is not an effective air barrier.


### **Comments on Installation Procedures:**

- RQ2 Terminology: Using the term “draft stops” continues to be an incorrect use of this term. Used here it implies something that stops air movement, whereas the CBC defines it as materials that provide fire resistance. Note that I have added language directly to the installations procedures.
- RQ2 Terminology: Note that I have added language to “voids” allowing properly installed inset stapling.
- RQ4.3.6 Loose-Fill Wall Insulation: There is no substantiating reason to remove the measurement protocol from this section. It is based on recommendation of the ICAA and is the only means of assuring installations meet the intent of the proposed energy credit. This section should remain intact. In addition, the first two bullets of RQ4.1 should be added to this section as there is no research

substantiating the air infiltration benefits of any insulation type—in other words, insulation does not reduce air infiltration.

- RQ5.2 Blown-In Ceiling Insulation. Change title to be consistent with RQ4.3.6 (i.e. “Loose-Fill Ceiling Insulation”).
- RQ5.2.1 General Requirements: There is no substantiating reason to remove the measurement protocol from this section. It is based on recommendation of the ICAA and is the only means of assuring installations meet the intent of the proposed energy credit. This section should remain intact.
- Note: There is no section covering inspection and measurement of spray foam applications, rigid foam sheathing, or the installation of radiant barriers. These insulations types, including radiant barriers are used and, in the case of radiant barriers, have explicit compliance calculations and installation requirements that must be followed in order to achieve the compliance credit. Installation procedures for these systems must be developed as well.

Sincerely,

A handwritten signature in black ink, appearing to read "David W. Ware". The signature is fluid and cursive, with a long horizontal stroke at the end.

David W. Ware  
Manager, Codes & Regulation  
Western Region